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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/718,912	11/21/2003	Graham W. Ketley	CN 37416	2385
4249	7590	07/11/2007		
CAROL WILSON BP AMERICA INC. MAIL CODE 5 EAST 4101 WINFIELD ROAD WARRENVILLE, IL 60555			EXAMINER SINGH, PREM C	
			ART UNIT 1764	PAPER NUMBER
			MAIL DATE 07/11/2007	DELIVERY MODE PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	10/718,912	KETLEY ET AL.	
	<b>Examiner</b>	<b>Art Unit</b>	
	Prem C. Singh	1764	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
  - If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
  - Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 17 May 2007.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1,2 and 9-14 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,2 and 9-14 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 21 November 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                     | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

## DETAILED ACTION

### *Response to Amendment*

1. Amendment to claims 1, 11, and 12 is noted.
2. Objection to claims 11 and 12 is withdrawn.

### *Claim Rejections - 35 USC § 103*

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

5. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein

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were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

6. Claims 1, 2, and 9-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gong et al (US 2002/0144932 A1) in view of Arena et al (US Patent 5,286,372).

7. With respect to claim 1, Gong discloses a process for the production of components for refinery blending of transportation fuels by selective oxidation of feed stocks comprising a mixture of hydrocarbons, sulfur-containing and nitrogen-containing organic compounds (See Abstract). Typically sulfur compounds are relatively non-polar, heteroaromatic sulfides (See page 5, paragraph 0049). The process comprises:

(a) "Beneficially, all or a portion of the low boiling fraction in substantially liquid form is diverted through conduit (32a) and into an optional oxygenation process unit (100) for catalytic oxidation in the liquid phase with a gaseous source of dioxygen, such as air or oxygen-enriched air." (Page 8, paragraph 0089).

(b) "A stream containing oxygenated organic compounds is subsequently separated to recover, for example, a fuel or a blending component of fuel and transferred to fuel facility (90) through conduit (32b)." Gong also mentions recovering a product having a suitable total acid number (See page 4, paragraph 0043).

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Gong does not specifically mention distillation to a cut point temperature by which 90% of the sulfur containing compounds in the feed would boil, and total acid number (TAN) less than about 2.0 mg KOH/g. However, Gong's disclosure of product having suitable TAN would necessarily have the distillation cut temperature as claimed.

Gong does not specifically mention about the oxidation catalyst used in step (a).

Arena invention discloses a process for treating a hydrocarbon fraction containing mercaptan, by an oxidizing agent (air) using an oxidation catalyst with an active metal from Group VIII that comprises magnesium or calcium oxide (See column 1, line 23; column 2, line 42; through column 3, line 8). The amount of metal is up to about 25 wt% of the composite (See column 5, lines 5-8).

Although Arena does not specifically mention treating nitrogen containing compounds in the feed, it is known to those skilled in the art that oxidation reaction with hydrocarbon fraction will react and remove nitrogen-containing compounds also along with sulfur-containing compounds as evidenced by Gong.

Since Gong and Arena both are treating hydrocarbon fraction to remove sulfur and nitrogen using oxygen in presence of an oxidation catalyst, it would have been obvious to one having ordinary skill in the art at the time the invention was made to disclose the oxidation catalyst in the Gong process as disclosed by Arena for sulfur and nitrogen removal.

8. With respect to claims 2, 9, and 14, Gong does not disclose the Group VIII metal and support.

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Arena discloses using cobalt on a magnesium oxide / aluminum oxide support (See column 3, lines 4-6).

As discussed under claim 1, it would have been obvious to one skilled in the art at the time the invention was made to specify the oxidation catalyst in Gong invention using cobalt metal on zinc oxide as disclosed by Arena for an effective removal of sulfur and nitrogen-containing compounds.

9. Claims 10 and 13 have all the limitations of claim 1, and discussed before.

10. With respect to claims 11 and 12, Gong does not specifically mention about sulfur and nitrogen content of the distillate fraction.

Since Gong produces and recovers distillate fraction after reaction with the oxygen gas in presence of an oxidation catalyst, as discussed in claim 1, similar to the Applicant's claimed process, it is expected that the sulfur and nitrogen content of the distillate fraction obtained in Gong process should necessarily be in a range as claimed.

### ***Response to Arguments***

11. Applicant's arguments filed 05/17/2007 have been fully considered but they are not persuasive.

12. The Applicant argues that Gong et al. does not disclose or suggest fractionating the organic phase separated from the oxidation reaction mixture to remove therefrom

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oxidized sulfur-containing and/or nitrogen-containing organic compounds. According to Gong et al. they are in the immiscible liquid phase, not in the organic phase.

The Applicant's argument is not persuasive because Gong discloses, "All or a portion of the low boiling fraction in substantially liquid form is diverted through conduit (32a) and into an optional oxygenation process unit (100) for catalytic oxidation in the liquid phase with a gaseous source of dioxygen, such as air or oxygen-enriched air." (Page 8, paragraph 0089). Gong further discloses, "A stream containing oxygenated organic compounds is subsequently separated to recover, for example, a fuel or a blending component of fuel and transferred to fuel facility (90) through conduit (32b)." Clearly, Gong is separating the hydrocarbon component from the oxidized sulfur-containing and/or nitrogen-containing organic compounds in a separator, which could be any suitable device, including a fractionator. Also, Gong is not disclosing an immiscible liquid phase in the present embodiment.

13. The Applicant argues that the optional oxygenation process of Gong is not for the removal of sulfur.

The Applicant's argument is not persuasive because Gong discloses, "A stream containing oxygenated organic compounds is subsequently separated....." (Page 8, paragraph 0090). Since sulfur present in the hydrocarbon feed is undergoing an oxygenation treatment in unit (100), similar to that claimed by the Applicant, sulfur is being removed similar to the Applicant's claim.

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14. The Applicant argues that the unit for oxygenation of the sulfur-lean fraction is beneficial, because increasing the content of oxygen-containing organic compounds in refinery transportation fuel is known to decrease the content of particulate emissions in exhaust from internal combustion engines.

The Applicant's argument is not persuasive because Gong uses an oxygenation zone (100) similar to the Applicant's claim. If the Applicant's process removes sulfur from the hydrocarbon stream, Gong must also be removing sulfur and not decreasing particulate emissions.

15. The Applicant argues about immiscible liquid phase in Gong invention.

The Applicant's argument is not persuasive because Gong is using immiscible liquid phase for sulfur-rich hydrocarbon stream (See page 9, paragraph 0092 and 0093) and the sulfur-lean hydrocarbon stream undergoes a process of oxygenation similar to the Applicant's (See page 8, paragraph 0089 and 0090).

16. The Applicant argues that the Applicant's novel process recites contacting distillate and solid oxidation catalyst. In particular ..... alkaline earth oxides. No immiscible liquid phase is used in the oxidation reaction mixture.

The Applicant's argument is not persuasive because Gong uses a similar catalytic oxygenation process as claimed by the Applicant and Arena discloses a similar oxygenation catalyst as suggested by Gong and claimed by the Applicant. Thus,



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combined teachings of Gong and Arena disclose each and every element of the Applicant's claim and discussed above in the Office action under claim 1.

17. The Applicant argues that step (b) --- separating a portion of the oxidized sulfur--- by distillation--, not a step of liquid to liquid transport.

The Applicant's argument is not persuasive because Gong discloses a similar step (See page 8, paragraph 0090). Although Gong does not specifically disclose distillation, it is known to those skilled in the art that separation step disclosed by Gong (Page 8, paragraph 0090) includes distillation.

18. The Applicant argues that various metal chelates cited by Arena are all described as requiring a solid support, none are suitable for use in the processes described in Gong et al for oxidation of a feedstock that contains heteroaromatic sulfur and nitrogen-containing organic impurities.

The Applicant's argument is not persuasive because Arena invention discloses a process for treating a hydrocarbon fraction containing mercaptan, by an oxidizing agent (air) using an oxidation catalyst with an active metal from Group VIII that comprises magnesium or calcium oxide (See column 1, line 23; column 2, line 42; through column 3, line 8). The amount of metal is up to about 25 wt% of the composite (See column 5, lines 5-8). Obviously, Arena is using a catalyst similar to that as claimed by the Applicant.

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19. The Applicant argues about 90% desulfurization and achieving sulfur levels to below 5 ppm.

The Applicant's argument has been addressed in the Office action under claims 11 and 12.

20. The Applicant argues that Gong and Arena do not suggest the essence of the novel multi-step process according to claims 1, 2, and 9 to 14.

The Applicant's argument is not persuasive and discussed in detail in the Office action.

21. The Applicant argues that with respect to claims 2, 9, and 14, the catalyst is to convert mercaptans to disulfides, which is in contradistinction to oxidation of heteroaromatic sulfur-containing and nitrogen containing organic impurities according to the Applicant's novel process.

The Applicant's argument is not persuasive because Gong discloses removal of heteroaromatic sulfur containing and nitrogen containing organic impurities (See page 3, paragraph 0030; page 5, paragraph 0049; page 7, paragraph 0068) and suggests using a catalytic oxidation (See page 8, paragraph 0089) as claimed by the Applicant. Arena discloses an oxygenation catalyst as disclosed by the Applicant. Thus, although Arena discloses removal of mercaptans, the catalyst used in Arena's process will inherently remove sulfur and nitrogen compounds as disclosed by Gong.

***Conclusion***

22. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

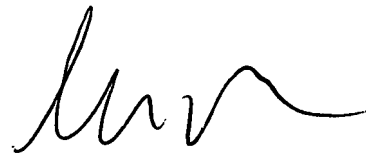
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Prem C. Singh whose telephone number is 571-272-6381. The examiner can normally be reached on 7:00 AM to 3:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Glenn Caldarola can be reached on 571-272-1444. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

PS/070207



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